NRCS Natural Resources Conservation Service

United States Department of Agriculture

Washington
Water Supply Outlook Report
March 1, 2021

Olallie Meadows SNOTEL site from the air on 2/27/2021. 15+ feet of snow equals 136% of normal snow water content, this why we use tall towers, shelters and precipitation gages. Olallie Meadows is remotely located in Old Growth forest near Snoqualmie Pass and hard to get to but notice the cross-country ski track in front of the site. Photo credit to Lauren Austin, Hydrologist, Oregon Snow Survey

Water Supply Outlook Reports
and
Federal - State – Private Cooperative Snow Surveys

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How forecasts are made

Most of the annual streamflow in the western United States originates as snowfall that has accumulated in the mountains during the winter and early spring. As the snowpack accumulates, hydrologists estimate the runoff that will occur when it melts. Measurements of snow water equivalent at selected manual snow courses and automated SNOTEL sites, along with precipitation, antecedent streamflow, and indices of the El Niño / Southern Oscillation are used in computerized statistical and simulation models to prepare runoff forecasts. These forecasts are coordinated between hydrologists in the Natural Resources Conservation Service and the National Weather Service. Unless otherwise specified, all forecasts are for flows that would occur naturally without any upstream influences.

Forecasts of any kind, of course, are not perfect. Streamflow forecast uncertainty arises from three primary sources: (1) uncertain knowledge of future weather conditions, (2) uncertainty in the forecasting procedure, and (3) errors in the data. The forecast, therefore, must be interpreted not as a single value but rather as a range of values with specific probabilities of occurrence. The middle of the range is expressed by the 50% exceedance probability forecast, for which there is a 50% chance that the actual flow will be above, and a 50% chance that the actual flow will be below, this value. To describe the expected range around this 50% value, four other forecasts are provided, two smaller values (90% and 70% exceedance probability) and two larger values (30%, and 10% exceedance probability). For example, there is a 90% chance that the actual flow will be more than the 90% exceedance probability forecast. The others can be interpreted similarly.

The wider the spread among these values, the more uncertain the forecast. As the season progresses, forecasts become more accurate, primarily because a greater portion of the future weather conditions become known; this is reflected by a narrowing of the range around the 50% exceedance probability forecast. Users should take this uncertainty into consideration when making operational decisions by selecting forecasts corresponding to the level of risk they are willing to assume about the amount of water to be expected. If users anticipate receiving a lesser supply of water, or if they wish to increase their chances of having an adequate supply of water for their operations, they may want to base their decisions on the 90% or 70% exceedance probability forecasts, or something in between. On the other hand, if users are concerned about receiving too much water (for example, threat of flooding), they may want to base their decisions on the 30% or 10% exceedance probability forecasts, or something in between. Regardless of the forecast value users choose for operations, they should be prepared to deal with either more or less water. (Users should remember that even if the 90% exceedance probability forecast is used, there is still a 10% chance of receiving less than this amount.) By using the exceedance probability information, users can easily determine the chances of receiving more or less water.

Washington
Water Supply Outlook

March 2021

General Outlook

February brought amazing snow fall across the state. With big snow comes big avalanche concerns which closed all mountain highway passes several times during the month. Precipitation was mostly near to much-above average for the month. February temperatures were 2-4 degrees below normal for the month, which brought much needed snow accumulation to the lower elevations and boosted some higher elevation sites to new records. Water-year temperatures are still trending slightly warmer than normal.

The most recent forecast through mid-March shows a high probability for below normal temperatures and above normal precipitation, with a return to near normal conditions later in the month. National Weather Service 3-month forecast, beginning March 1, indicates below normal temperatures and above normal precipitation which is indicative of the continuation of Enso La Nina. The US Drought Monitor indicates D0-D2 drought designation persisting in the south-central part of the state, showing a slight improvement from last month. (see maps page 4)

Snowpack

The March 1 statewide SNOTEL readings were 132% of normal, considerably higher than last month. The lowest readings in the state were 68% of the 30-year median for March 1 in the Newman Lake Basin. The Puyallup River Basin had the most snow with 149%. Westside medians from SNOTEL and March 1 snow surveys, included the North Puget Sound river basins with 125% of normal, the Central and South Puget river basins with 141% and 140% respectively, and the Lower Columbia basins with 131% of normal. Snowpack along the east slopes of the Cascade Mountains included the Yakima area with 122% and the Wenatchee area with 125%. Snowpack in the Spokane River Basin was at 99% and the Upper Columbia river basins had 128% of the long-term median.

BASIN	PERCENT OF MEDIAN	LAST YEAR PERCENT MEDIAN
Spokane	99	108
Newman Lake	95	111
Lower Pend Oreille	97	110
Kettle	120	131
Okanogan	128	99
Methow	133	105
Conconully Lake	133	78
Central Columbia	125	101
Upper Yakima	129	104
Naches	123	120
Lower Yakima	116	90
Ahtanum Creek	116	90
Walla Walla	135	117
Lower Snake	123	111
Cowlitz	138	123
Lewis	129	94
White	137	127
Green	147	104
Puyallup	149	125
Cedar	136	97
Snoqualmie	139	97
Skykomish	148	118
Skagit	126	112
Nooksack	133	109
Olympic Peninsula	129	113

Precipitation

March precipitation accumulation was near to much-above average across the state. The big winner was the Walla Walla area with 256% precipitation. Individual stations ranged from 388% to a low of 61%. Statewide water-year average was 115% as of March 1. SNOTEL collects all form of precipitation including, rain, snow or sleet and hail.

RIVER BASIN	MARCH PERCENT OF AVERAGE	WATER YEAR PERCENT OF AVERAGE
Spokane	141	98
Lower Pend Oreille	108	93
Upper Columbia	145	117
Central Columbia	111	113
Upper Yakima	179	114
Naches	153	108
Lower Yakima	145	101
Klickitat	154	101
Walla Walla	256	124
Lower Snake	223	114
Lower Columbia	165	110
South Puget Sound	205	119
Central Puget Sound	245	125
North Puget Sound	195	113
Olympic Peninsula	118	93

Reservoir

Seasonal reservoir levels in Washington can vary greatly due to specific watershed management practices required in preparation for irrigation season, fisheries management, power generation, municipal demands and flood control. March 1 Reservoir storage in the Yakima Basin was 479,900-acre feet, 107% of average for the Upper Reaches and 158,800-acre feet or 116% of average for Rimrock and Bumping Lakes. The power generation reservoirs included the following: Coeur d'Alene Lake, 61,600-acre feet, 46% of average and 26% of capacity; and Ross lake within the Skagit River Basin at 94% of average and 54% of capacity. Recent climate impacts and management procedures may affect these numbers on a daily or weekly basis.

BASIN	PERCENT OF CAPACITY	CURRENT STORAGE AS PERCENT OF AVERAGE
Spokane	26	46
Lower Pend Oreille	36	71
Upper Columbia	58	93
Central Columbia	35	84
Upper Yakima	58	107
Naches	69	116
Lower Snake	70	102
North Puget Sound	54	94

For more information contact your local Natural Resources Conservation Service office.

Streamflow

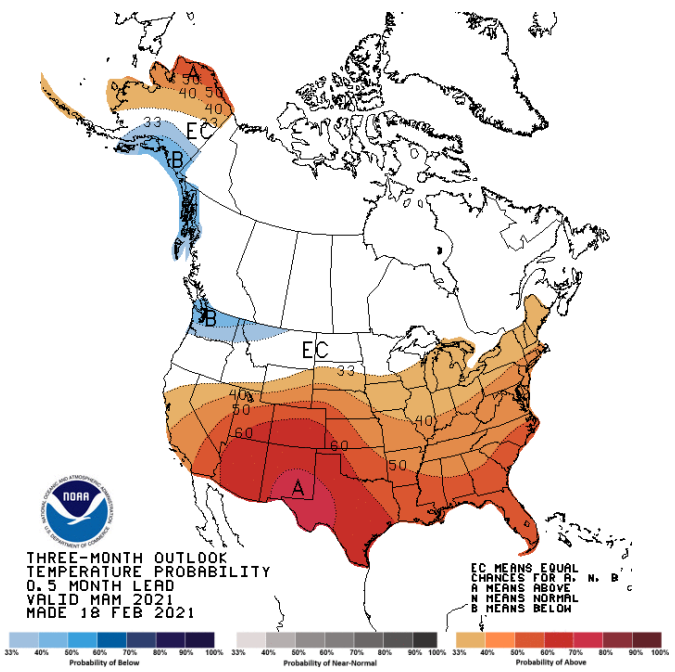
Early winter forecasts for April-September stream flows are never quite as robust as they are later in the season when we know more about the winter climatology. At times only a few degrees warmer or cooler than forecasted can make or break stream flow predictions. Volumetric forecasts are developed using current, historic and average snowpack, precipitation and streamflow data collected and coordinated by organizations cooperating with NRCS. Caution should be used when using early season forecasts for critical water resource management decisions since governing conditions are likely to change for the better or the worse

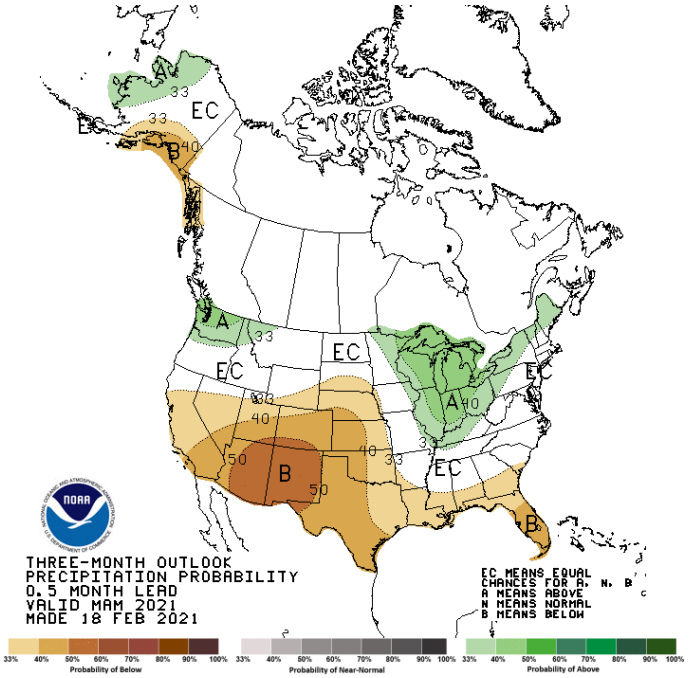
BASIN	PERCENT OF AVERAGE FORCAST (50% CHANCE OF EXCEEDENCE)
Spokane	100-121
Pend Oreille	96-106
Upper Columbia	97-143
Central Columbia	99-118
Upper Yakima	123-138
Lower Yakima	116-128
Lower Snake-Walla Walla	85-123
Lower Columbia	109-122
South Puget Sound	116-121
Central Puget Sound	125-143
North Puget Sound	109-117
Olympic Peninsula	110-115

STREAM	PERCENT OF AVERAGE MARCH STREAMFLOWS
Pend Oreille at Albeni Fall Dam	63
Kettle at Laurier	90
Columbia at Birchbank	101
Spokane at Spokane	51
Similkameen at Nighthawk	105
Okanogan at Tonasket	115
Methow at Pateros	115
Chelan at Chelan	91
Stehekin near Stehekin	89
Wenatchee at Pashastin	84
Cle Elum near Roslyn	94
Yakima at Parker	76
Naches at Naches	55
Grande Ronde at Troy	54
Snake below Lower Granite Dam	58
Columbia River at The Dalles	70
Lewis at Merwin Dam	94
Cowlitz below Mayfield Dam	111
Skagit at Concrete	86
Dungeness near Sequim	54

For more information contact your local Natural Resources Conservation Service office.

Climate





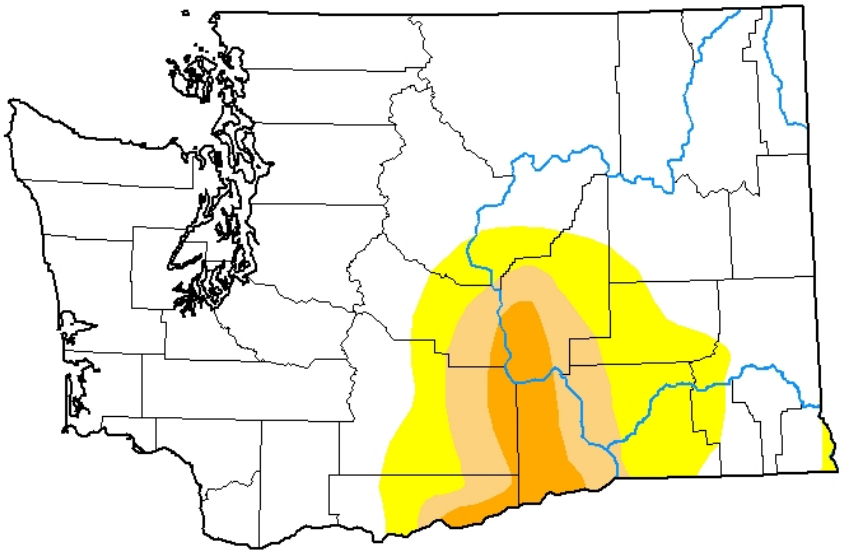
U.S. Drought Monitor

Washington

February 23, 2021

(Released Thursday, Feb. 25, 2021)

Valid 7 a.m. EST



Intensity:

- None
- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. For more information on the Drought Monitor, go to https://droughtmonitor.unl.edu/About.aspx

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droughtmonitor.unl.edu

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Helpful Internet Addresses

NRCS Snow Survey and Climate Services Homepages

Washington:
http://www.nrcs.usda.gov/wps/portal/nrcs/main/wa/snow/

Oregon:
http://www.nrcs.usda.gov/wps/portal/nrcs/main/or/snow/

Idaho:
http://www.nrcs.usda.gov/wps/portal/nrcs/main/id/snow/

National Water and Climate Center (NWCC):
http://www.wcc.nrcs.usda.gov

USDA-NRCS Agency Homepages

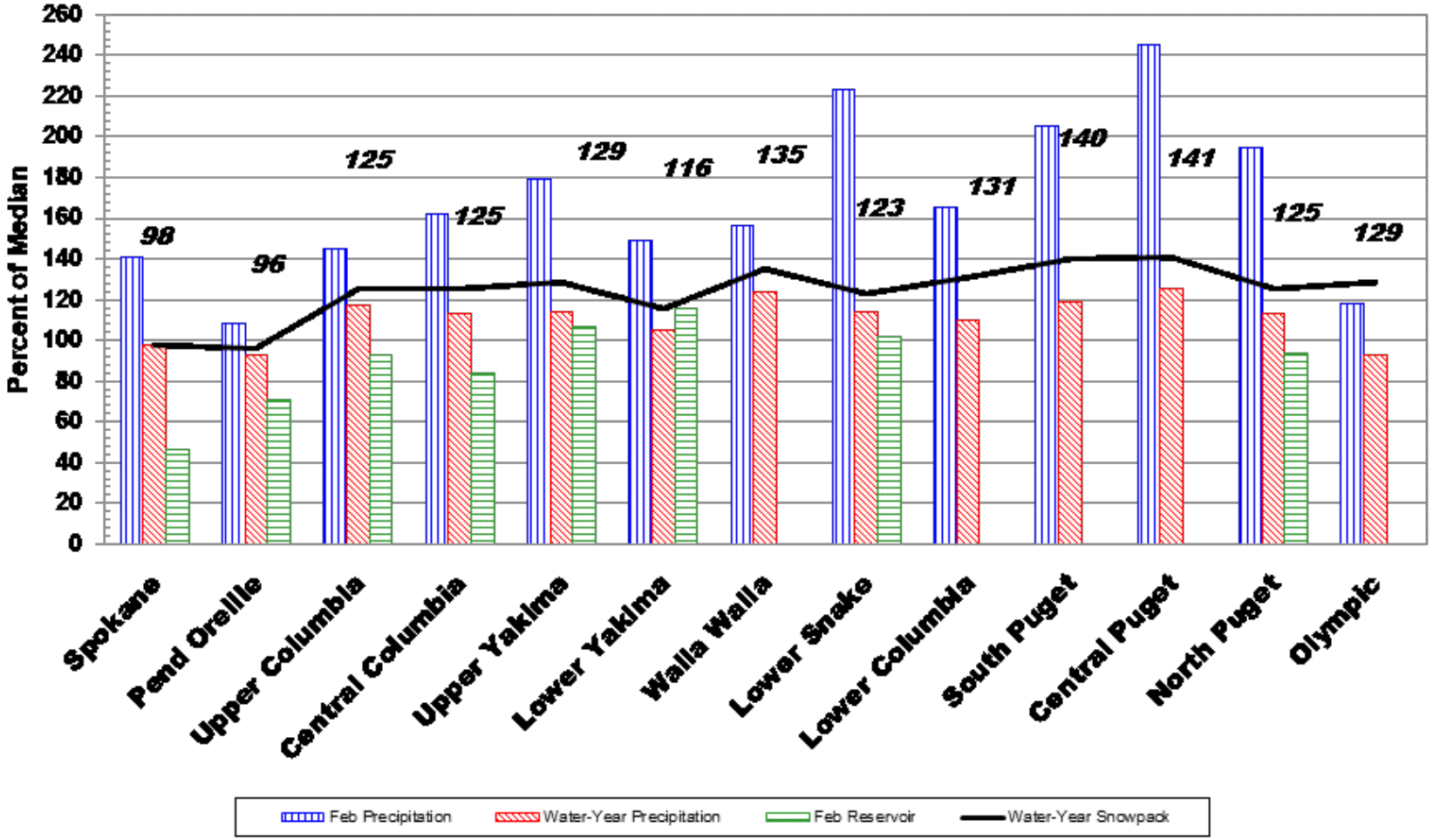
Washington:
http://www.nrcs.usda.gov/wps/portal/nrcs/site/wa/home/

NRCS National:
http://www.nrcs.usda.gov/wps/portal/nrcs/site/national/home/

NRCS Natural Resources Conservation Service

March 1, 2020 - Snowpack, Precipitation and Reservoir Conditions at a Glance

(Water Year = October 1 - Current Date)



88th Annual Western Snow Conference
April 12-15, 2021
Virtual Meeting
Bridging the Gap between Research and Operations

For public safety and health reasons, the 88th Annual Meeting of the Western Snow Conference will be held in a virtual format. The virtual format this year provides a unique opportunity to increase participation, particularly among those who would otherwise be unable to attend due to financial, geographic, or time constraints. You are invited to submit an abstract of 150 – 300 words for either oral or poster presentation by March 31, 2021. Those who submitted successful abstracts last year will be given preference as we prepare the 2021 conference agenda.

Details of this unique conference are still being finalized, including formats, platforms, and opportunity for vendor participation. Please check back here for updated information.

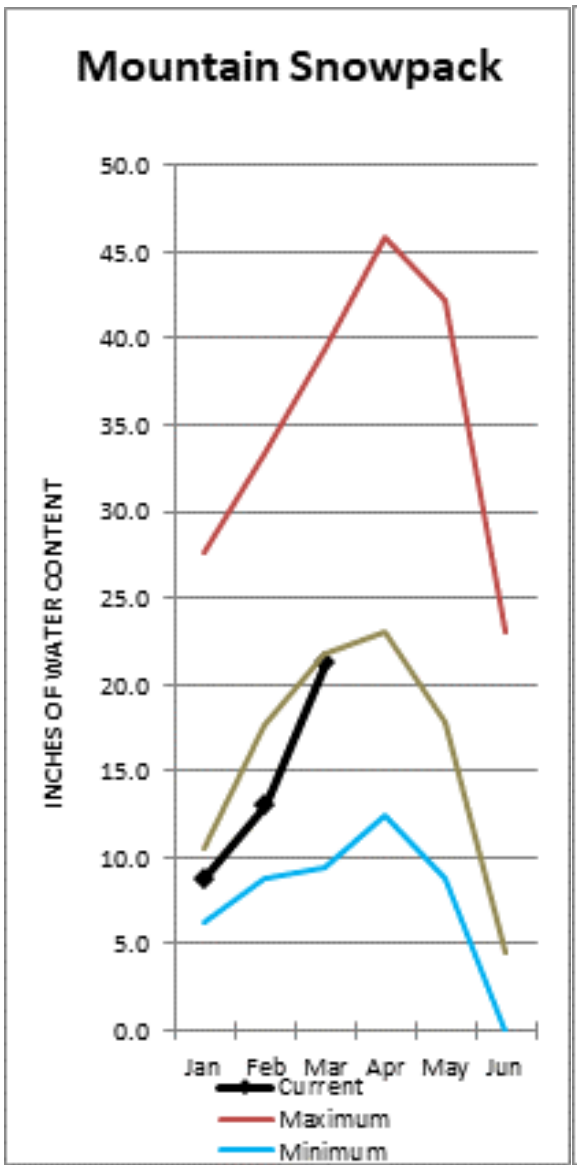
We are looking forward to "seeing" you online in April as we move ahead in this new world!

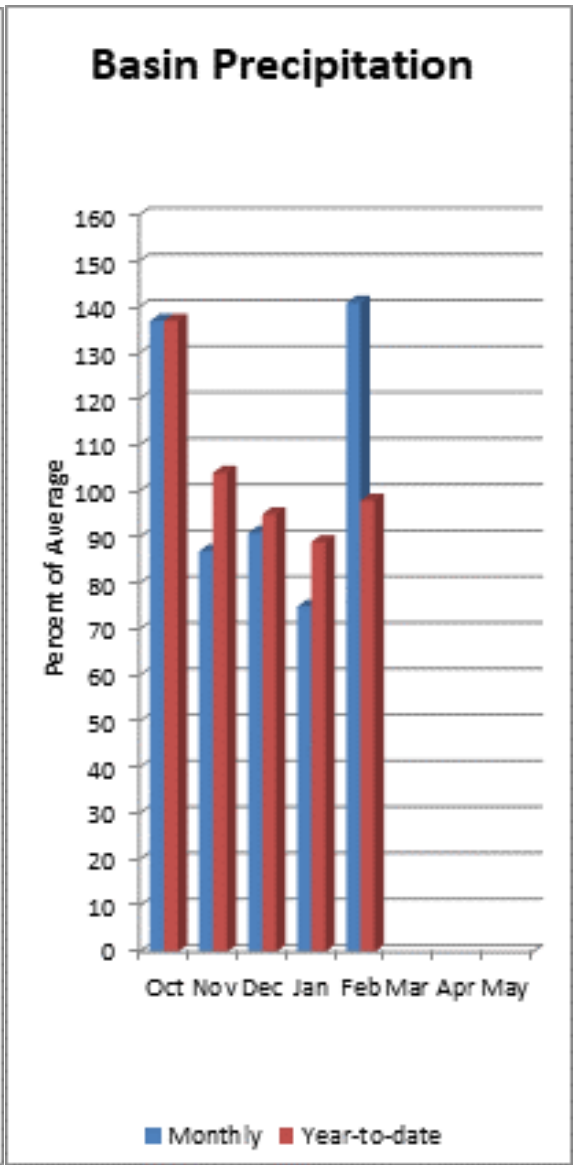
Noah Molotch — General Chair, WSC

Lucas Zukiewicz — Conference Chair

Additional information about the conference will be posted on the WSC web page at http://www.westernsnowconference.org/

Also find Western Snow Conference on Facebook





Basin snowpack is 99% of normal and precipitation is 98% of average for the water year. Precipitation for February was much above normal at 141% of average. Streamflow on the Spokane River at Spokane was 51% of average for February. March 1 storage in Coeur d'Alene Lake was 61,00-acre feet, 46% of average and 26% of capacity. Snowpack at Quartz Peak SNOTEL site was 108% of average with 21 inches of water content.

For more information contact your local Natural Resources Conservation Service office.

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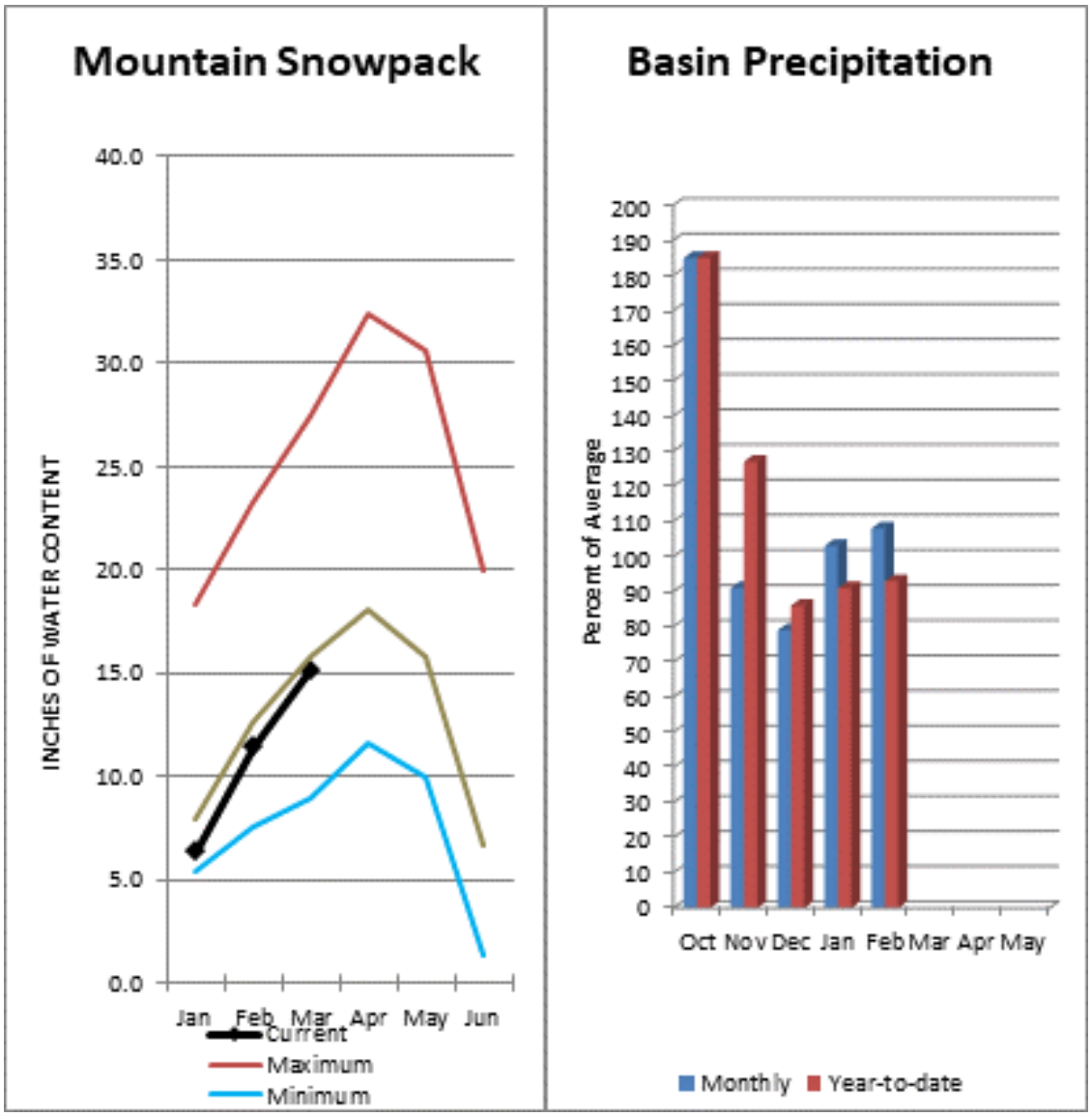
Spokane
Streamflow Forecasts - March 1, 2021

Spokane	Forecast Period	Forecast Exceedance Probabilities for Risk Assessment: Chance that actual volume will exceed forecast — 90% (KAF)	70% (KAF)	50% (KAF)	% Avg	30% (KAF)	10% (KAF)	30yr Avg (KAF)
Spokane R nr Post Falls[2]								
	APR-JUL	2070	2550	2880	121%	3210	3690	2390
	APR-SEP	2150	2640	2970	120%	3300	3790	2480
Spokane R at Long Lake[2]								
	APR-JUL	2360	2850	3190	122%	3520	4010	2620
	APR-SEP	2550	3050	3400	119%	3740	4240	2850
Chamokane Ck nr Long Lake								
	MAR-JUL	13.2	20	26	100%	32	43	26

1) 90% and 10% exceedance probabilities are actually 95% and 5%
2) Forecasts are for unimpaired flows. Actual flow will be dependent on management of upstream reservoirs and diversions
3) Median value used in place of average

Reservoir Storage End of February, 2021	Current (KAF)	Last Year (KAF)	Average (KAF)	Capacity (KAF)
Lake Coeur d' Alene	61.6	64.8	132.8	238.5
Basin-wide Total	61.6	64.8	132.8	238.5
# of reservoirs	1	1	1	1

Watershed Snowpack Analysis March 1, 2021	# of Sites	% Median	Last Year % Median
Spokane	17	99%	108%
Newman Lake	4	95%	111%



March streamflow was 63% of average on the Pend Oreille River and 101% on the Columbia at Birchbank. March 1 snow cover was 97% of normal in the Pend Oreille Basin River Basin. Bunchgrass Meadows SNOTEL site had 21.5 inches of snow water on the snow pillow which is slightly below normal for March 1. Precipitation during February was 108% of average, bringing the year-to-date precipitation to 93% of average. Reservoir storage in the basin, including Lake Pend Oreille and Priest Lake was 71% of normal.

For more information contact your local Natural Resources Conservation Service office.

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Lower Pend Oreille
Streamflow Forecasts - March 1, 2021

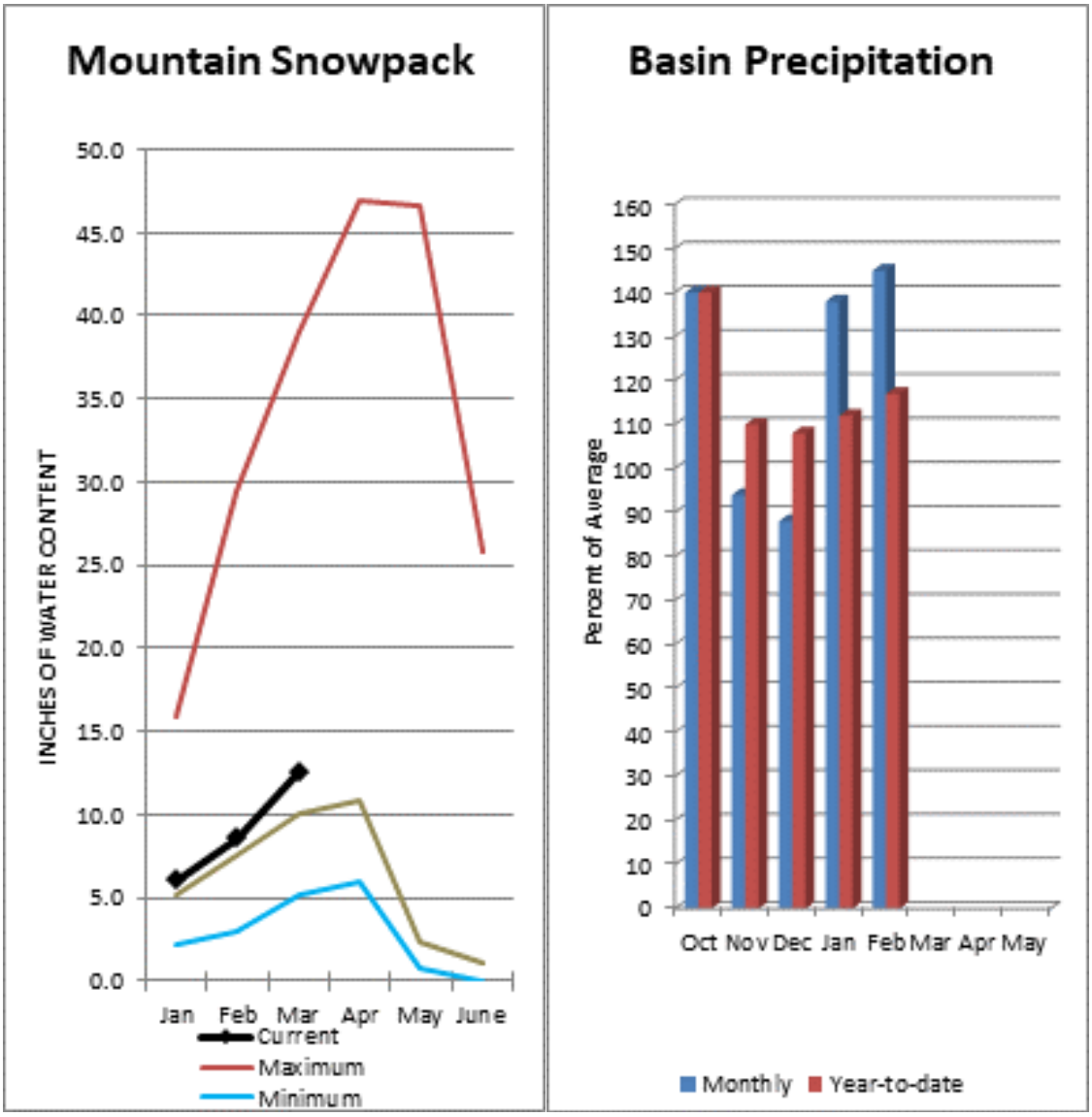
Forecast Exceedance Probabilities for Risk Assessment
Chance that actual volume will exceed forecast

Lower Pend Oreille	Forecast Period	90% (KAF)	70% (KAF)	50% (KAF)	% Avg	30% (KAF)	10% (KAF)	30yr Avg (KAF)
Pend Oreille Lake Inflow[2]								
	APR-JUL	9680	11400	12500	106%	13600	15300	11800
	APR-SEP	10500	12400	13600	106%	14800	16700	12800
Priest R nr Priest River[2]								
	APR-JUL	540	665	750	96%	835	960	780
	APR-SEP	575	705	795	96%	880	1010	830
Pend Oreille R bl Box Canyon[2]								
	APR-JUL	9880	11500	12600	106%	13800	15400	11900
	APR-SEP	10700	12500	13800	106%	15000	16800	13000

1) 90% and 10% exceedance probabilities are actually 95% and 5%
2) Forecasts are for unimpaired flows. Actual flow will be dependent on management of upstream reservoirs and diversions
3) Median value used in place of average

Reservoir Storage End of February, 2021	Current (KAF)	Last Year (KAF)	Average (KAF)	Capacity (KAF)
Lake Pend Oreille	559.6	561.3	792.6	1561.3
Priest Lake	41.8	50.6	57.1	119.3
Basin-wide Total	601.4	611.9	849.7	1680.6
# of reservoirs	2	2	2	2

Watershed Snowpack Analysis March 1, 2021	# of Sites	% Median	Last Year % Median
Lower Pend Oreille	12	97%	110%
Sullivan	1	96%	115%



March 1 snow cover on the Okanogan was 128% of normal, Omak Creek was 127% and the Methow was 133%. February precipitation in the Upper Columbia was 145% of average, with precipitation for the water year at 117% of average. February streamflow for the Methow River was 115% of average, 115% for the Okanogan River and 105% for the Similkameen. Snow-water content at Salmon Meadows SNOTEL was 11.4 inches or 131% of normal for March 1. Combined storage in the Conconully Reservoirs was 13,600 acre-feet or 93% of normal.

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Upper Columbia
Streamflow Forecasts - March 1, 2021

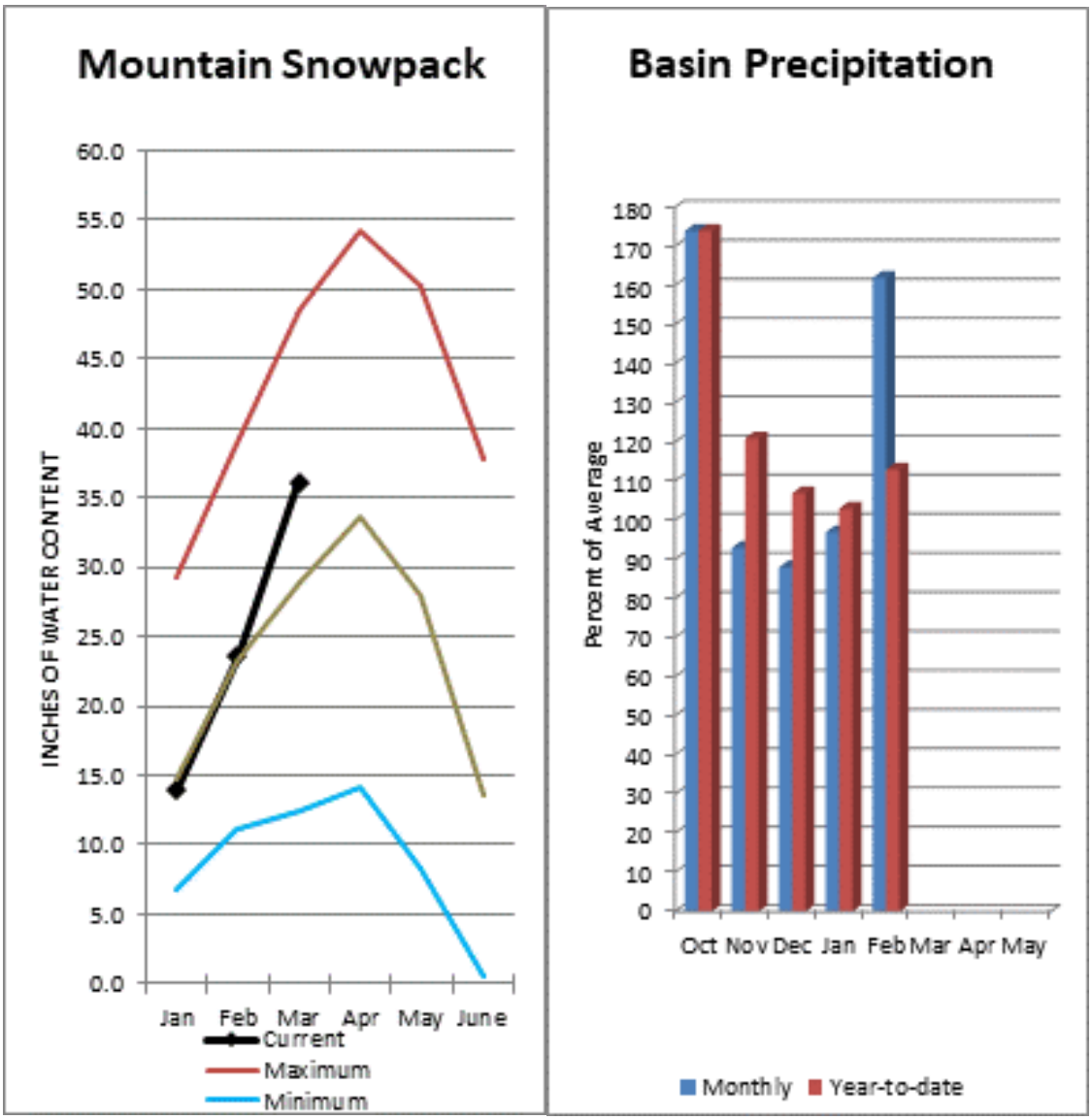
Forecast Exceedance Probabilities for Risk Assessment
Chance that actual volume will exceed forecast

Upper Columbia	Forecast Period	90% (KAF)	70% (KAF)	50% (KAF)	% Avg	30% (KAF)	10% (KAF)	30yr Avg (KAF)
Kettle R nr Laurier								
	APR-JUL	1650	1850	1980	110%	2110	2310	1800
	APR-SEP	1710	1920	2060	110%	2200	2410	1880
Colville R at Kettle Falls								
	APR-JUL	62	102	129	108%	156	196	119
	APR-SEP	68	111	141	108%	171	215	131
Columbia R at Grand Coulee-NWS[2]								
	APR-JUL	45800		49400	97%		55100	51015
	APR-SEP	53700		58600	97%		64300	60110
Similkameen R nr Nighthawk								
	APR-JUL	1450	1600	1710	143%	1820	1970	1200
	APR-SEP	1520	1690	1810	141%	1930	2100	1280
Okanogan R nr Tonasket								
	APR-JUL	1460	1720	1900	128%	2080	2340	1480
	APR-SEP	1610	1910	2110	128%	2310	2610	1650
Okanogan R at Malott								
	APR-JUL	1490	1760	1940	134%	2120	2390	1450
	APR-SEP	1630	1930	2140	132%	2350	2660	1620
Methow R nr Pateros								
	APR-JUL	910	1050	1140	137%	1230	1370	835
	APR-SEP	985	1130	1230	137%	1330	1480	895

1) 90% and 10% exceedance probabilities are actually 95% and 5%
2) Forecasts are for unimpaired flows. Actual flow will be dependent on management of upstream reservoirs and diversions
3) Median value used in place of average

Reservoir Storage End of February, 2021	Current (KAF)	Last Year (KAF)	Average (KAF)	Capacity (KAF)
Conconully Lake (Salmon Lake Dam)	6.2	6.9	7.3	10.5
Conconully Reservoir	7.4	7.8	7.4	13.0
Basin-wide Total	13.6	14.7	14.7	23.5
# of reservoirs	2	2	2	2

Watershed Snowpack Analysis March 1, 2021	# of Sites	% Median	Last Year % Median
Upper Columbia	41	125%	110%
Colville	2	114%	92%
Kettle	7	121%	133%
Okanogan	17	127%	102%
Omak	2	127%	72%
Sanpoil	3	125%	74%
Similkameen	16	130%	107%
Toats Coulee	41	125%	110%
Conconully Lake	4	133%	78%
Methow	9	133%	105%



Precipitation during February was 162% of average in the basin and 113% for the year-to-date. February average streamflow on the Chelan River was 91% and on the Wenatchee River 84%. March 1 snowpack in the Wenatchee River Basin was 126% of normal; the Chelan, 119%; the Entiat, 126%; Stemilt Creek, 93% and Colockum Creek, 123%. Reservoir storage in Lake Chelan was 93% of average. Lyman Lake SNOTEL had the most snow water with 53.9 inches of water. This site would normally have 48.6 inches on March 1.

For more information contact your local Natural Resources Conservation Service office.

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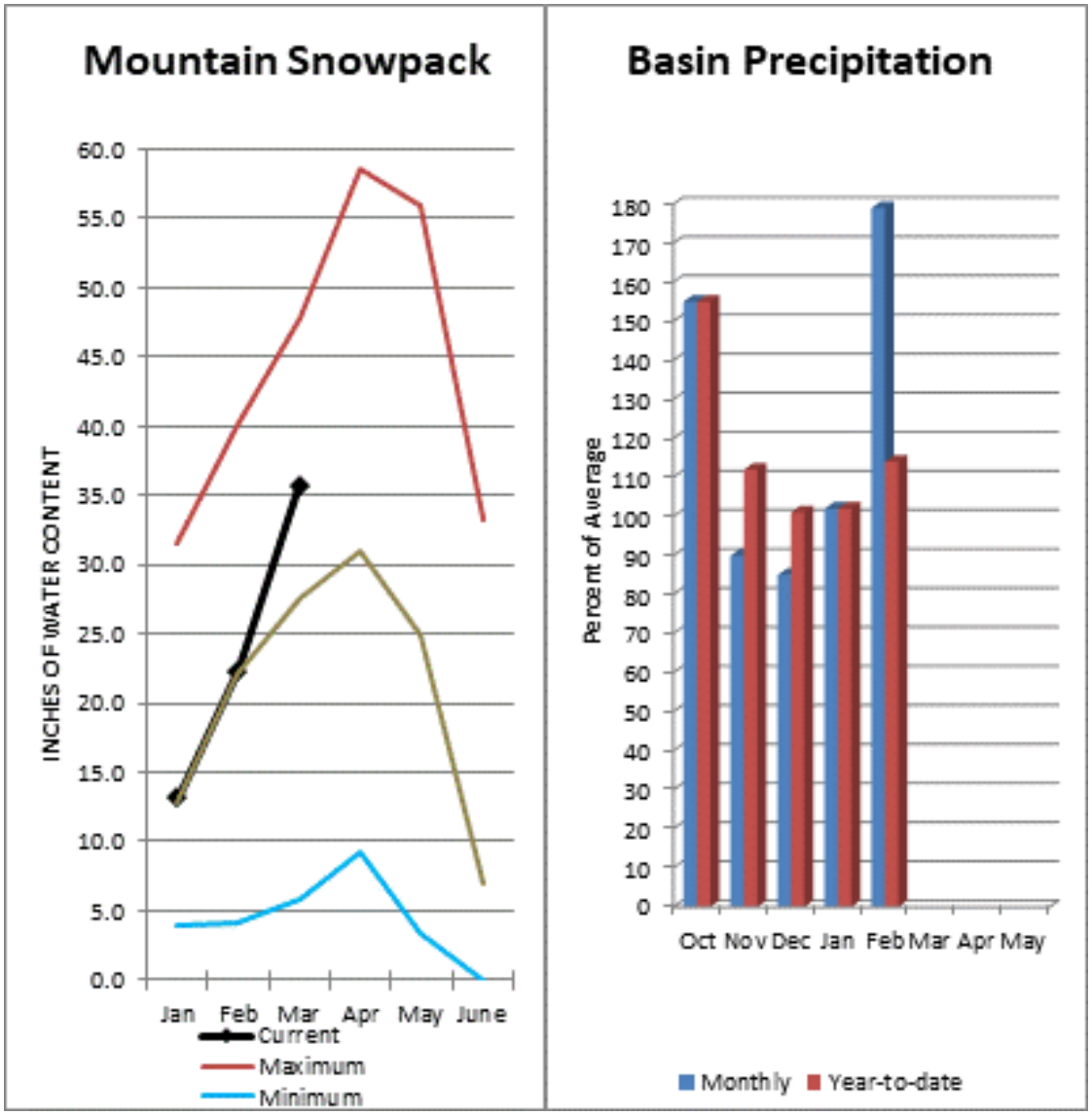
Central Columbia
Streamflow Forecasts - March 1, 2021

		Forecast Exceedance Probabilities for Risk Assessment Chance that actual volume will exceed forecast						
Central Columbia	Forecast Period	90% (KAF)	70% (KAF)	50% (KAF)	% Avg	30% (KAF)	10% (KAF)	30yr Avg (KAF)
Stehekin R at Stehekin								
	APR-JUL	640	715	765	113%	815	890	680
	APR-SEP	745	830	885	112%	940	1020	790
Chelan R at Chelan								
	APR-JUL	960	1070	1140	114%	1210	1320	1000
	APR-SEP	1070	1200	1280	114%	1360	1490	1120
Entiat R nr Ardenvoir								
	APR-JUL	177	200	220	110%	240	265	200
	APR-SEP	192	220	240	109%	260	290	220
Wenatchee R at Plain								
	APR-JUL	960	1080	1160	117%	1240	1360	990
	APR-SEP	1040	1180	1270	118%	1360	1500	1080
Icicle Ck nr Leavenworth								
	APR-JUL	255	295	320	116%	345	385	275
	APR-SEP	280	320	350	117%	380	420	300
Wenatchee R at Peshastin								
	APR-JUL	1320	1480	1580	115%	1680	1840	1370
	APR-SEP	1440	1610	1730	116%	1850	2020	1490
Columbia R bl Rock Island Dam-NWS[2]								
	APR-JUL	50700		55000	99%		61200	55770
	APR-SEP	59500		64800	99%		71500	65200

1) 90% and 10% exceedance probabilities are actually 95% and 5%
2) Forecasts are for unimpaired flows. Actual flow will be dependent on management of upstream reservoirs and diversions
3) Median value used in place of average

Reservoir Storage End of February, 2021	Current (KAF)	Last Year (KAF)	Average (KAF)	Capacity (KAF)
Lake Chelan	235.3	215.9	279.8	677.4
Basin-wide Total	235.3	215.9	279.8	677.4
# of reservoirs	1	1	1	1

Watershed Snowpack Analysis March 1, 2021	# of Sites	% Median	Last Year % Median
Central Columbia	10	125%	101%
Lake Chelan	3	119%	101%
Entiat	1	126%	75%
Wenatchee	6	126%	104%
Stemilt	1	93%	68%
Colockum	1	123%	80%



March 1 reservoir storage for the Upper Yakima reservoirs was 479,900-acre feet, 107% of average. February streamflow on the Cle Elum River near Roslyn was 91%. March 1 snowpack was 129% based upon 9 snow course and SNOTEL readings within the Upper Yakima Basin. Precipitation was 179% of average for February and 114% for the water-year. Volume forecasts for the Yakima Basin are for natural flow. As such, they may differ from the U.S. Bureau of Reclamation's forecast for the total water supply available, which includes irrigation return flow.

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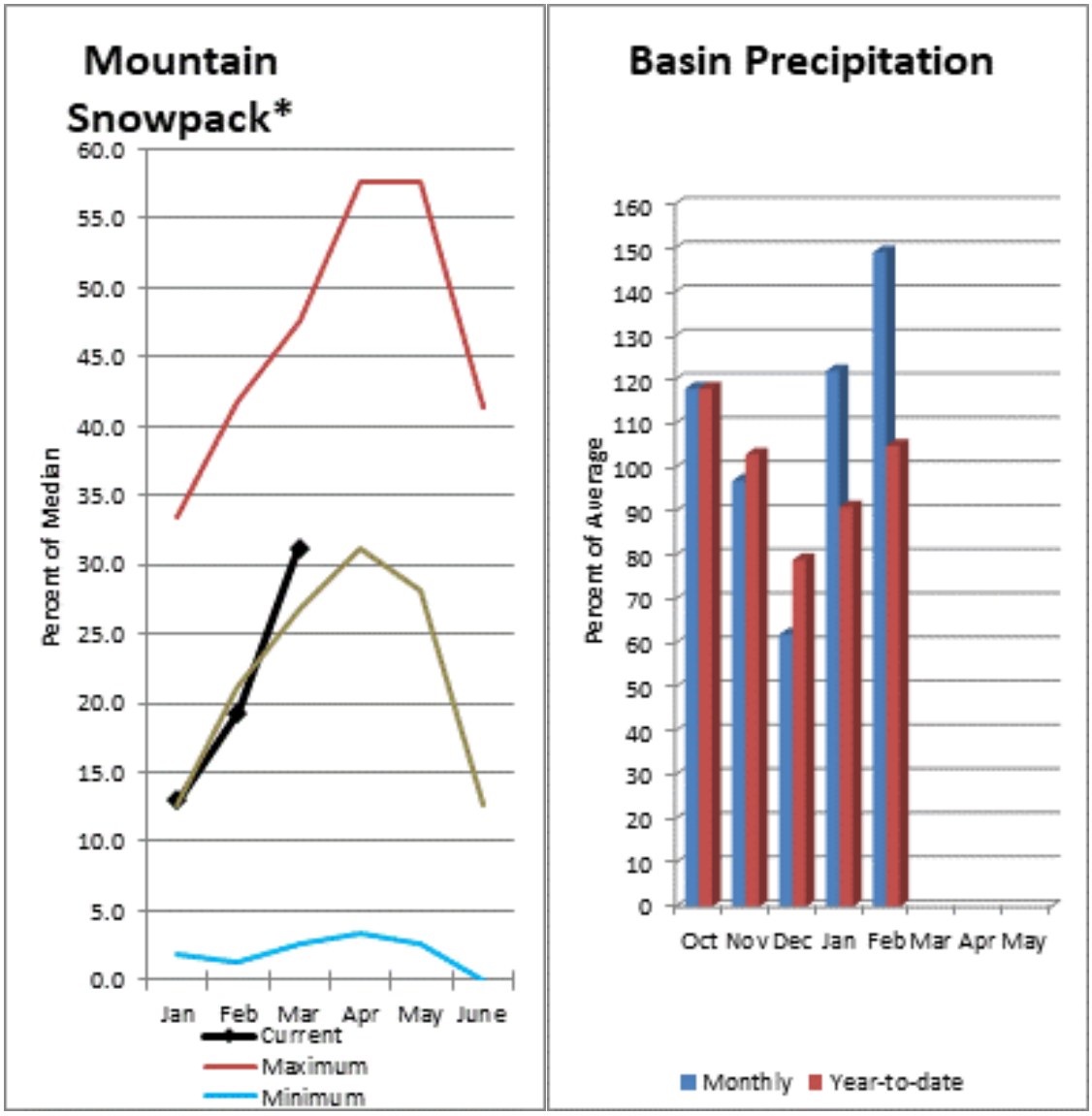
Upper Yakima
Streamflow Forecasts - March 1, 2021

Upper Yakima	Forecast Period	90% (KAF)	70% (KAF)	50% (KAF)	% Avg	30% (KAF)	10% (KAF)	30yr Avg (KAF)
		Forecast Exceedance Probabilities for Risk Assessment Chance that actual volume will exceed forecast						
Keechelus Reservoir Inflow[2]								
	APR-JUL	113	133	147	127%	161	182	116
	APR-SEP	123	145	159	126%	174	196	126
Kachess Reservoir Inflow [2]								
	APR-JUL	105	122	133	128%	144	161	104
	APR-SEP	113	130	142	126%	154	171	113
Cle Elum Lake Inflow [2]								
	APR-JUL	395	445	475	123%	505	555	385
	APR-SEP	430	480	515	124%	550	600	415
Teanaway R bl Forks nr Cle Elum								
	APR-JUL	135	161	179	138%	197	225	130
	APR-SEP	137	164	182	137%	200	225	133

1) 90% and 10% exceedance probabilities are actually 95% and 5%
2) Forecasts are for unimpaired flows. Actual flow will be dependent on management of upstream reservoirs and diversions
3) Median value used in place of average

Reservoir Storage End of February, 2021	Current (KAF)	Last Year (KAF)	Average (KAF)	Capacity (KAF)
Keechelus	99.7	113.8	92.3	157.8
Kachess	165.5	133.9	143.6	239.0
Cle Elum	214.7	212.7	214.4	436.9
Basin-wide Total	479.9	460.4	450.3	833.7
# of reservoirs	3	3	3	3

Watershed Snowpack Analysis March 1, 2021	# of Sites	% Median	Last Year % Median
Upper Yakima	9	129%	104%



February average streamflows within the basin were: Yakima River near Parker, 76% and the Naches River near Naches, 55%. March 1 reservoir storage for Bumping and Rimrock reservoirs was 158,800-acre feet, 116% of average. March 1 snowpack was 116% within the Lower Yakima Basin, 123% in the Naches and Ahtanum Creek reported in at 116% of normal. February precipitation was 153% of average and 108% for the water-year in the Naches River Basin. The Lower Yakima recorded 145% of average for February and 101% for the water-year. Volume forecasts for Yakima Basin are for natural flow. As such, they may differ from the U.S. Bureau of Reclamation's forecast for the total water supply available, which includes irrigation return flow.

For more information contact your local Natural Resources Conservation Service office.

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Lower Yakima
Streamflow Forecasts - March 1, 2021

Lower Yakima	Forecast Period	90% (KAF)	70% (KAF)	50% (KAF)	% Avg	30% (KAF)	10% (KAF)	30yr Avg (KAF)
		Forecast Exceedance Probabilities for Risk Assessment Chance that actual volume will exceed forecast						
Ahtanum Ck at Union Gap								
	APR-JUL	21	29	35	130%	40	49	27
	APR-SEP	23	31	37	128%	43	52	29
Yakima R nr Parker [2]								
	APR-JUL	1650	1920	2110	127%	2300	2580	1660
	APR-SEP	1800	2100	2300	126%	2490	2790	1820

1) 90% and 10% exceedance probabilities are actually 95% and 5%
2) Forecasts are for unimpaired flows. Actual flow will be dependent on management of upstream reservoirs and diversions
3) Median value used in place of average

Watershed Snowpack Analysis March 1, 2021	# of Sites	% Median	Last Year % Median
Lower Yakima	2	116%	90%
Ahtanum	2	116%	90%
Simcoe-Toppenish	1	103%	73%
Satus	0		

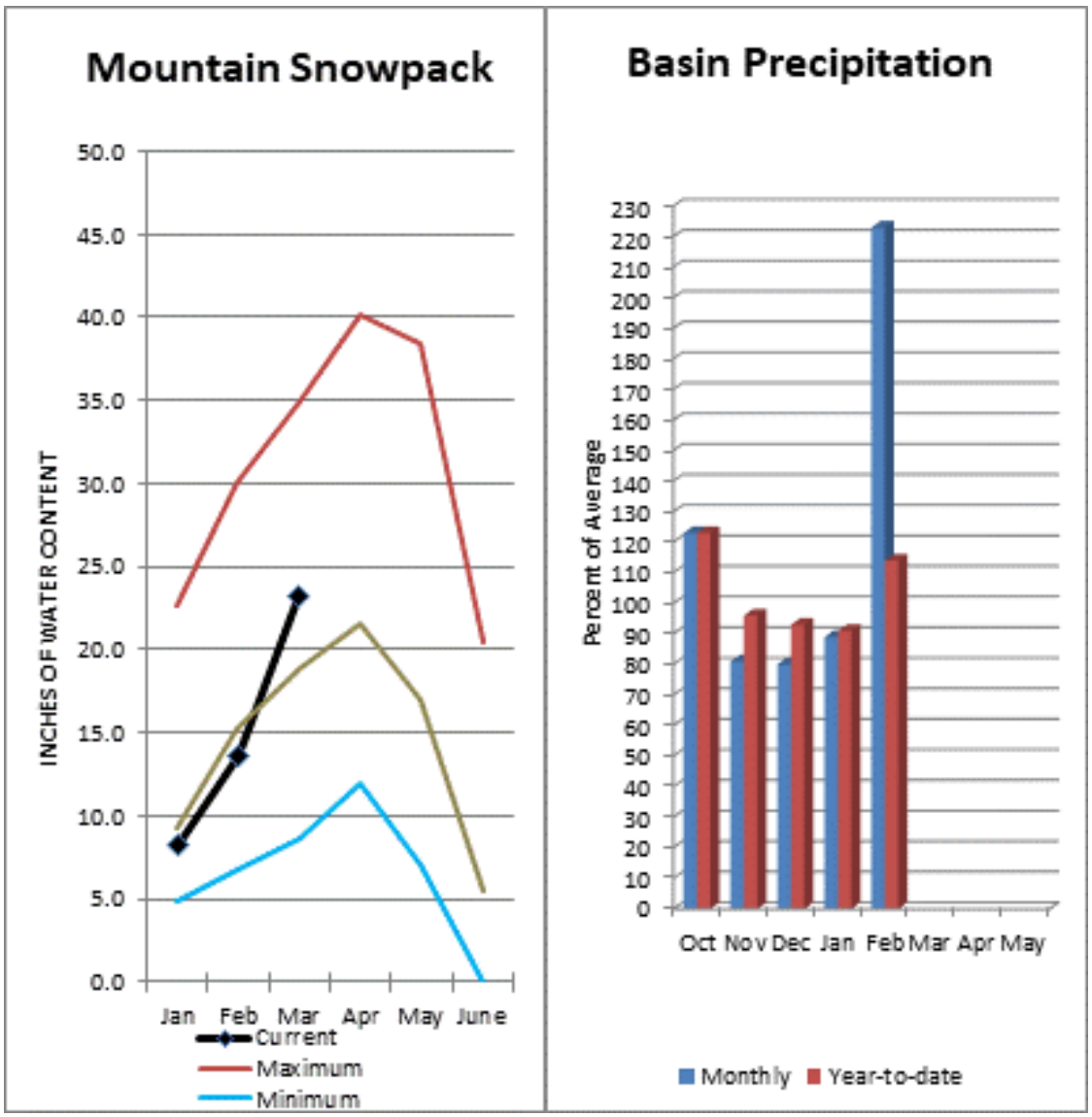
Naches
Streamflow Forecasts - March 1, 2021

Naches	Forecast Period	90% (KAF)	70% (KAF)	50% (KAF)	% Avg	30% (KAF)	10% (KAF)	30yr Avg (KAF)
		Forecast Exceedance Probabilities for Risk Assessment Chance that actual volume will exceed forecast						
Bumping Lake Inflow [2]								
	APR-JUL	106	122	133	117%	144	160	114
	APR-SEP	116	133	145	118%	157	174	123
American R nr Nile								
	APR-JUL	97	111	120	118%	130	143	102
	APR-SEP	105	120	131	119%	141	157	110
Rimrock Lake Inflow [2]								
	APR-JUL	180	200	215	115%	230	250	187
	APR-SEP	210	235	255	116%	270	300	220
Naches R nr Naches								
	APR-JUL	650	770	855	122%	935	1060	700
	APR-SEP	700	840	930	122%	1020	1160	760

1) 90% and 10% exceedance probabilities are actually 95% and 5%
2) Forecasts are for unimpaired flows. Actual flow will be dependent on management of upstream reservoirs and diversions
3) Median value used in place of average

Reservoir Storage End of February, 2021	Current (KAF)	Last Year (KAF)	Average (KAF)	Capacity (KAF)
Bumping Lake	21.8	25.8	13.3	33.7
Rimrock	137.0	140.2	123.3	198.0
Basin-wide Total	158.8	166.0	136.6	231.7
# of reservoirs	2	2	2	2

Watershed Snowpack Analysis March 1, 2021	# of Sites	% Median	Last Year % Median
Naches	7	123%	120%



February precipitation was 223% of average, bringing the year-to-date precipitation to 114% of average. March 1 snowpack readings averaged 122% of normal. February streamflow was 58% of average for Snake River below Lower Granite Dam and 54% for Grande Ronde River near Troy. Dworshak Reservoir storage was 102% of average.

For more information contact your local Natural Resources Conservation Service office.

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Lower Snake-Walla Walla
Streamflow Forecasts - March 1, 2021

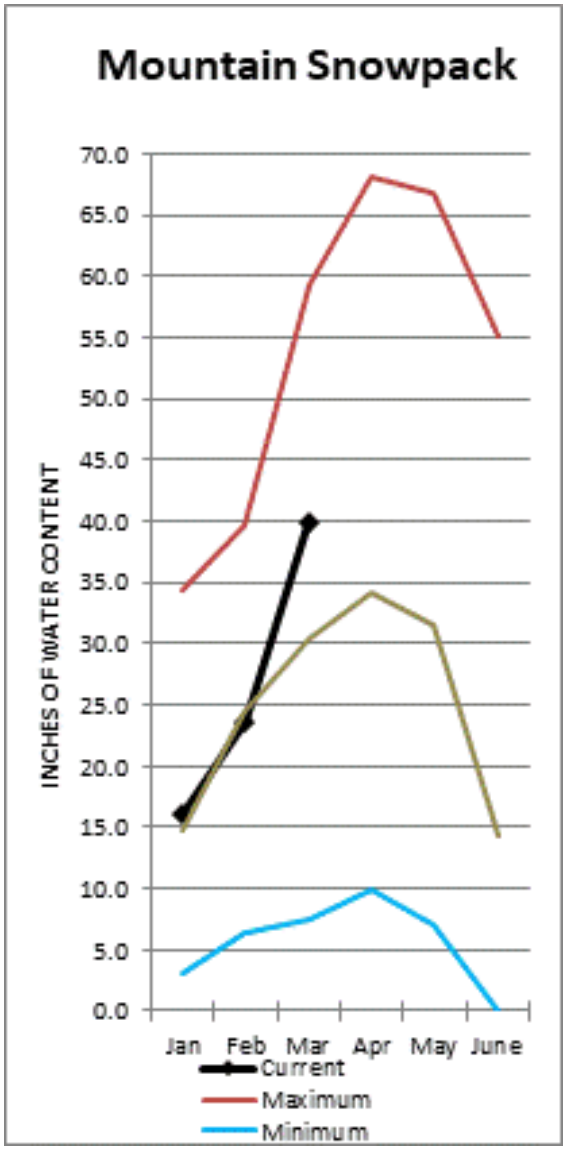
Forecast Exceedance Probabilities for Risk Assessment
Chance that actual volume will exceed forecast

Lower Snake-Walla Walla	Forecast Period	90% (KAF)	70% (KAF)	50% (KAF)	% Avg	30% (KAF)	10% (KAF)	30yr Avg (KAF)
Grande Ronde R at Troy								
	MAR-JUL	1470	1710	1880	125%	2050	2300	1510
	APR-SEP	1200	1440	1610	123%	1780	2030	1310
Asotin Ck at Asotin								
Clearwater R at Spalding[2]								
	APR-JUL	6050	7060	7750	112%	8430	9450	6890
	APR-SEP	6390	7440	8140	112%	8850	9900	7270
Snake R bl Lower Granite Dam-NWS[2]								
	APR-JUL	14300		16600	84%		20600	19848
	APR-SEP	16400		18900	85%		23200	22280
SF Walla Walla R nr Milton-Freewater								
	MAR-JUL	65	74	80	118%	86	95	68
	APR-SEP	62	71	77	117%	83	92	66
Mill Ck nr Walla Walla								
	APR-JUL	21	25	27	113%	30	34	24
	APR-SEP	24	28	31	115%	34	38	27

1) 90% and 10% exceedance probabilities are actually 95% and 5%
2) Forecasts are for unimpaired flows. Actual flow will be dependent on management of upstream reservoirs and diversions
3) Median value used in place of average

Reservoir Storage End of February, 2021	Current (KAF)	Last Year (KAF)	Average (KAF)	Capacity (KAF)
Dworshak Reservoir	2413.9	2272.0	2358.0	3468.0
Basin-wide Total	2413.9	2272.0	2358.0	3468.0
# of reservoirs	1	1	1	1

Watershed Snowpack Analysis March 1, 2021	# of Sites	% Median	Last Year % Median
Lower Snake-Walla Walla	20	122%	111%
Asotin	2	144%	109%
Grande Ronde	18	126%	117%
Walla Walla	4	135%	117%



The Columbia at The Dalles is forecasted to have 94% of average flows this summer according to the River Forecast Center. February average streamflow for Cowlitz River was 111% and the Columbia River at The Dalles was 70% of average. February precipitation was 165% of average and the water-year average was 110%. March 1 snow cover for Cowlitz River was 138%, and Lewis River was 129% of normal.

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Lower Columbia
Streamflow Forecasts - March 1, 2021

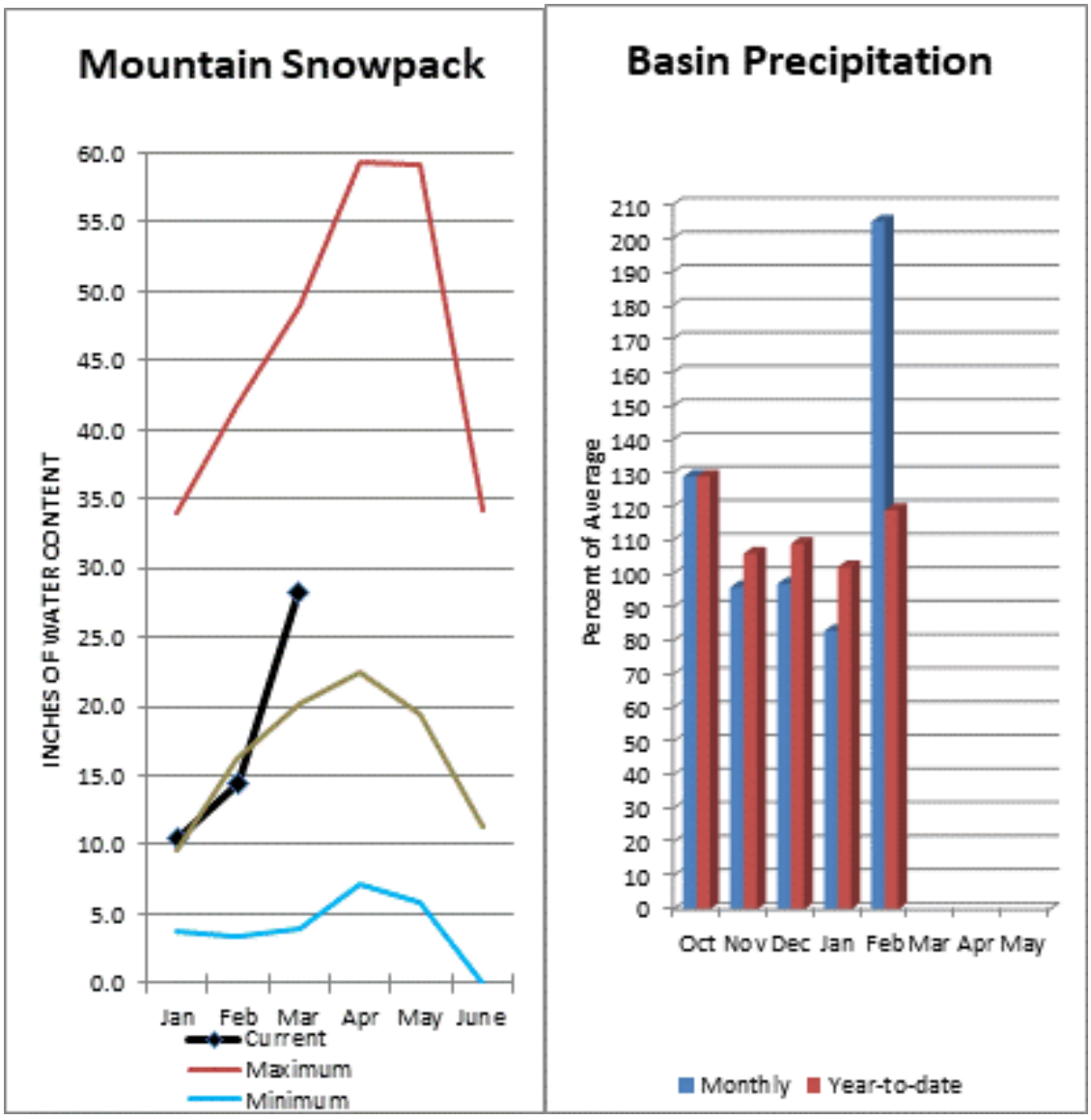
Forecast Exceedance Probabilities for Risk Assessment
Chance that actual volume will exceed forecast

Lower Columbia	Forecast Period	90% (KAF)	70% (KAF)	50% (KAF)	% Avg	30% (KAF)	10% (KAF)	30yr Avg (KAF)
Columbia R at The Dalles-NWS[2]								
	APR-JUL	70700		75100	94%		86000	79855
	APR-SEP	81400		87600	94%		100000	92704
Klickitat R nr Glenwood								
	APR-JUL	114	135	149	118%	163	184	126
	APR-SEP	127	149	164	118%	179	200	139
Klickitat R nr Pitt								
	APR-JUL	405	475	520	120%	570	635	435
	APR-SEP	495	570	625	120%	675	755	520
Lewis R at Ariel[2]								
	APR-JUL	775	955	1080	111%	1200	1380	970
	APR-SEP	905	1090	1220	109%	1340	1520	1120
Cowlitz R bl Mayfiled[2]								
	APR-JUL	1530	1800	1990	122%	2170	2440	1630
	APR-SEP	1750	2040	2230	121%	2430	2710	1840
Cowlitz R at Castle Rock[2]								
	APR-JUL	1980	2430	2730	122%	3030	3480	2240
	APR-SEP	2280	2750	3060	120%	3380	3840	2540

1) 90% and 10% exceedance probabilities are actually 95% and 5%
2) Forecasts are for unimpaired flows. Actual flow will be dependent on management of upstream reservoirs and diversions
3) Median value used in place of average

Reservoir Storage End of February, 2021	Current (KAF)	Last Year (KAF)	Average (KAF)	Capacity (KAF)
Yale				0.0
Swift			622.5	0.0
Mossyrock Dam (Riffe Lk)		839.7	1213.0	0.0
Merwin			398.3	0.0
Basin-wide Total		0.0	0.0	
# of reservoirs	0	0	0	0

Watershed Snowpack Analysis March 1, 2021	# of Sites	% Median	Last Year % Median
Lower Columbia	12	131%	110%
Lewis	6	129%	94%
Cowlitz	8	138%	123%



March 1 snowpack was 137% of average for the White River, 149% for Puyallup River and 147% in the Green River Basin. February precipitation was 205% of average, bringing the water year-to-date to 119% of average for the basins.

For more information contact your local Natural Resources Conservation Service office.

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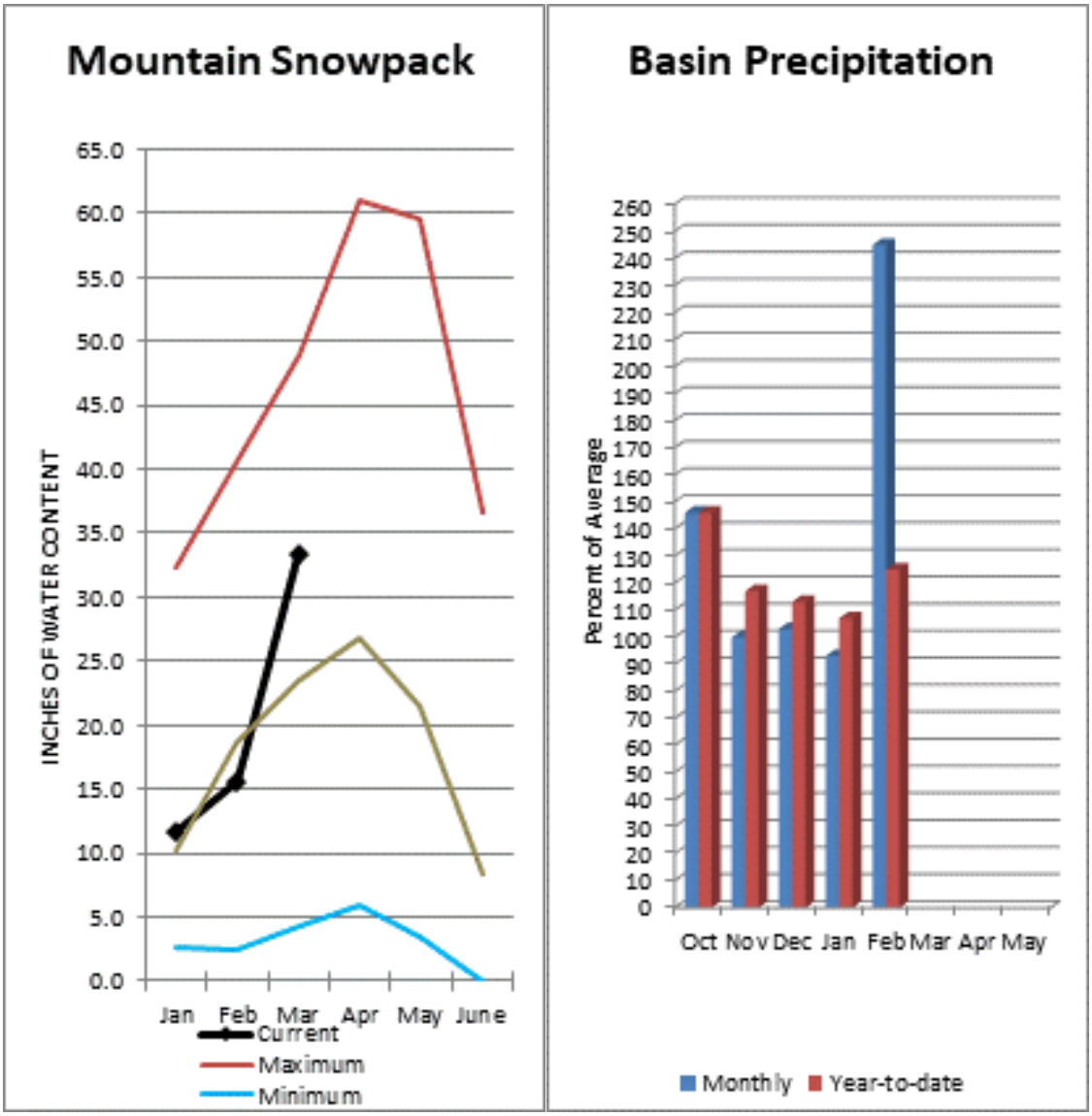
South Puget Sound
Streamflow Forecasts - March 1, 2021

South Puget Sound	Forecast Period	90% (KAF)	70% (KAF)	50% (KAF)	% Avg	30% (KAF)	10% (KAF)	30yr Avg (KAF)
		Forecast Exceedance Probabilities for Risk Assessment Chance that actual volume will exceed forecast						
White R nr Buckley[1,2]								
	APR-JUL	390	470	505	117%	540	620	430
	APR-SEP	440	530	595	116%	610	700	515
Green R bl Howard A Hanson Dam[1,2]								
	APR-JUL	169	250	285	121%	320	400	235
	APR-SEP	198	280	315	121%	355	435	260

1) 90% and 10% exceedance probabilities are actually 95% and 5%
2) Forecasts are for unimpaired flows. Actual flow will be dependent on management of upstream reservoirs and diversions
3) Median value used in place of average

Watershed Snowpack Analysis March 1, 2021	# of Sites	% Median	Last Year % Median
South Puget Sound	11	140%	119%
White	4	137%	127%
Puyallup	2	149%	125%
Green	5	147%	104%



Basin-wide precipitation for February was 245% of average, bringing water-year-to-date to 125% of average. March 1 median snow cover in Cedar River Basin was 136%, Tolt River Basin was 149%, Snoqualmie River Basin was 139%, and Skykomish River Basin was 148%.

For more information contact your local Natural Resources Conservation Service office.

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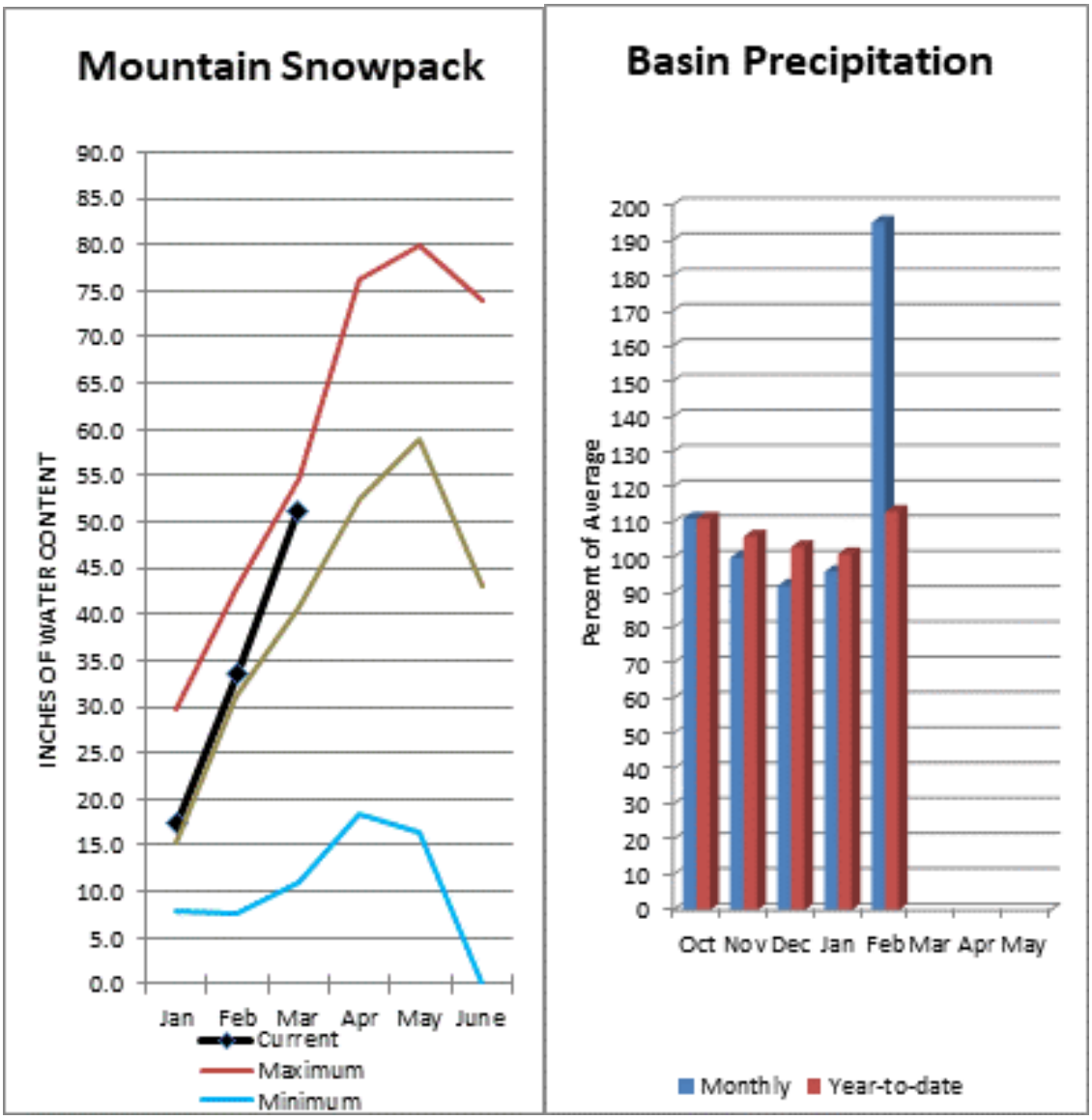
Central Puget Sound
Streamflow Forecasts - March 1, 2021

		Forecast Exceedance Probabilities for Risk Assessment Chance that actual volume will exceed forecast						
Central Puget Sound	Forecast Period	90% (KAF)	70% (KAF)	50% (KAF)	% Avg	30% (KAF)	10% (KAF)	30yr Avg (KAF)
Cedar R nr Cedar Falls								
	APR-JUL	72	87	97	139%	107	122	70
	APR-SEP	77	92	103	136%	114	129	76
Rex R nr Cedar Falls								
	APR-JUL	24	29	33	138%	36	42	24
	APR-SEP	26	32	36	133%	40	46	27
Taylor Ck nr Selleck								
	APR-JUL	19.6	23	25	125%	27	30	20
	APR-SEP	25	28	30	125%	32	35	24
SF Tolt R nr Index								
	APR-JUL	15.5	18.2	20	141%	22	25	14.2
	APR-SEP	17.9	21	23	143%	25	28	16.1

1) 90% and 10% exceedance probabilities are actually 95% and 5%
2) Forecasts are for unimpaired flows. Actual flow will be dependent on management of upstream reservoirs and diversions
3) Median value used in place of average

Watershed Snowpack Analysis March 1, 2021	# of Sites	% Median	Last Year % Median
Central Puget Sound	12	141%	106%
Cedar	8	136%	97%
Tolt	3	149%	113%
Snoqualimie	5	139%	97%
Skykomish	4	148%	118%



Runoff is forecasted to be near to slightly above average for the 3 major basins represented. February streamflow in Skagit River was 86% of average. Basin-wide precipitation for February was 195% of average, bringing water-year-to-date to 113% of average. March 1 average snow cover in Skagit River Basin was 126% and the Nooksack River Basin was 133%. March 1 Skagit River reservoir storage was 94% of average and 54% of capacity.

For more information contact your local Natural Resources Conservation Service office.

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North Puget Sound
Streamflow Forecasts - March 1, 2021

North Puget Sound	Forecast Period	90% (KAF)	70% (KAF)	50% (KAF)	% Avg	30% (KAF)	10% (KAF)	30yr Avg (KAF)
		Forecast Exceedance Probabilities for Risk Assessment Chance that actual volume will exceed forecast						
Thunder Ck nr Newhalem								
	APR-JUL	220	240	255	109%	270	290	235
	APR-SEP	320	345	360	109%	375	400	330
Skagit R at Newhalem[2]								
	APR-JUL	1740	1930	2050	117%	2180	2370	1750
	APR-SEP	2070	2280	2420	117%	2570	2780	2070
Baker R at Concrete								
	APR-JUL	750	845	910	117%	975	1070	780
	APR-SEP	970	1070	1140	116%	1220	1320	980

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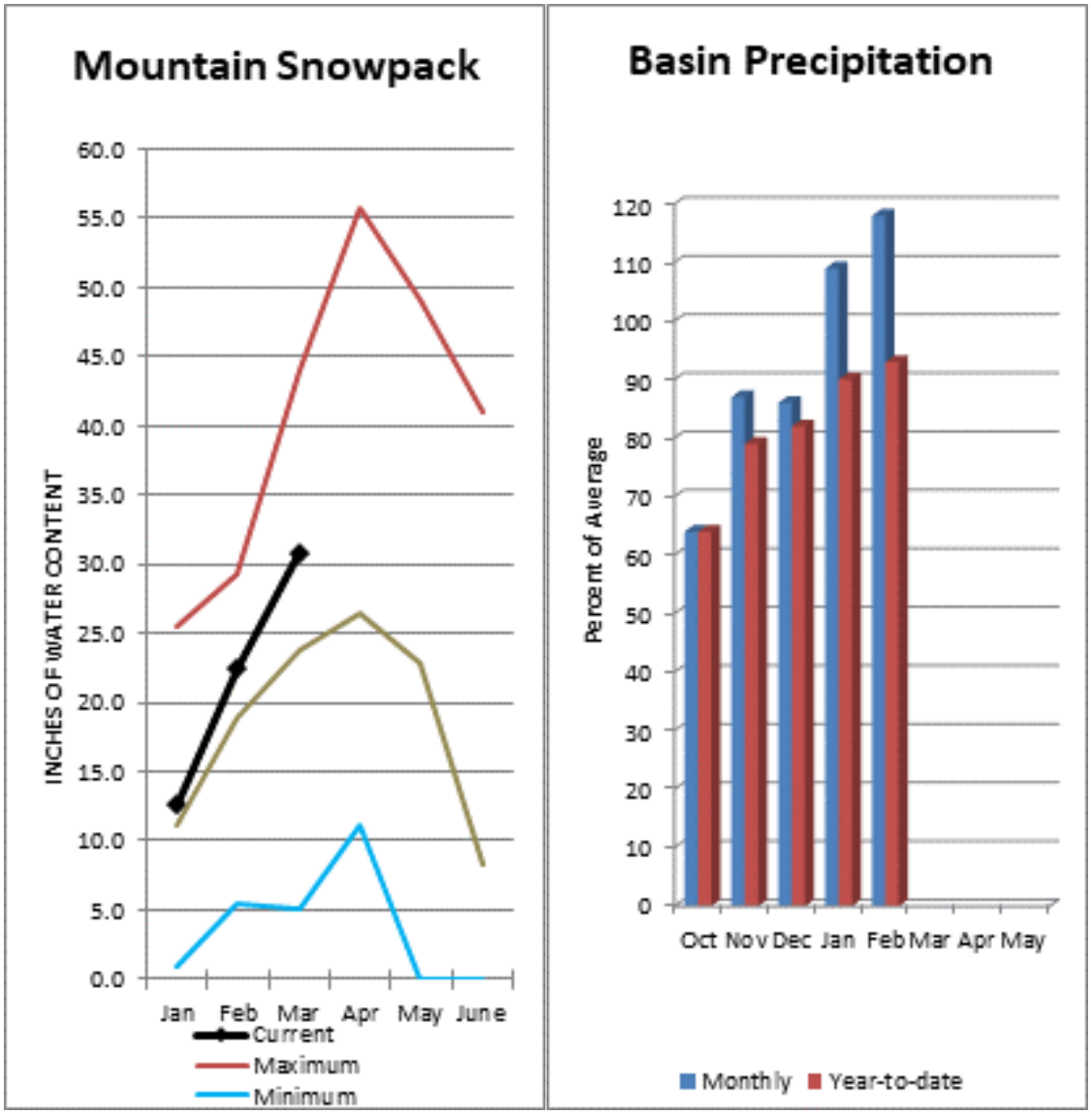
2) Forecasts are for unimpaired flows. Actual flow will be dependent on management of upstream reservoirs and diversions
3) Median value used in place of average

Reservoir Storage End of February, 2021	Current (KAF)	Last Year (KAF)	Average (KAF)	Capacity (KAF)
Ross	781.7	788.4	832.4	1434.7
Diablo Reservoir			86.2	90.6
Basin-wide Total	781.7	788.4	832.4	1434.7
# of reservoirs	1	1	1	1

Watershed Snowpack Analysis March 1, 2021	# of Sites	% Median	Last Year % Median
North Puget Sound	18	125%	109%
Skagit	13	126%	113%
Baker	0		
Nooksack	3	133%	109%



February runoff in the Dungeness River was 54% of normal. February precipitation was 118% of average. Precipitation has accumulated at 93% of average for the water year. February precipitation at Quillayute was 111 % of normal brining water-year precipitation to 108%. Olympic Peninsula snowpack averaged 129% of normal on March 1.

For more information contact your local Natural Resources Conservation Service office.

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Olympic
Streamflow Forecasts - March 1, 2021

		Forecast Exceedance Probabilities for Risk Assessment Chance that actual volume will exceed forecast						
Olympic	Forecast Period	90% (KAF)	70% (KAF)	50% (KAF)	% Avg	30% (KAF)	10% (KAF)	30yr Avg (KAF)
Dungeness R nr Sequim								
	APR-JUL	101	118	130	108%	142	160	120
	APR-SEP	122	145	160	110%	175	198	145
Elwha R at McDonald Br nr Port Angeles								
	APR-JUL	360	420	460	115%	500	555	400
	APR-SEP	430	495	540	115%	585	650	470

1) 90% and 10% exceedance probabilities are actually 95% and 5%
2) Forecasts are for unimpaired flows. Actual flow will be dependent on management of upstream reservoirs and diversions
3) Median value used in place of average

Watershed Snowpack Analysis March 1, 2021	# of Sites	% Median	Last Year % Median
Olympic	6	129%	113%

Issued by

Terry Cosby
Acting Chief
Natural Resources Conservation Service
U.S. Department of Agriculture

Released by

Roylene Comes-At-Night
State Conservationist
Natural Resources Conservation Service
Spokane, Washington

The Following Organizations Cooperate with the Natural Resources Conservation Service in Snow Survey Work*:

Canada	Snow Survey Network Program – British Columbia Ministry of Environment
	River Forecast Center – British Columbia Ministry of Forests, Lands and Natural Resource Operations
State	Washington State Department of Ecology
	Washington State Department of Natural Resources
	Washington State Fish and Wildlife
Federal	Department of the Army, Corps of Engineers
	U.S. Department of Agriculture, Forest Service
	U.S. Department of Commerce, NOAA, National Weather Service
	U.S. Department of Interior
	Bonneville Power Administration
	Bureau of Reclamation
	Geological Survey
	National Park Service
	Bureau of Indian Affairs
	U.S. Fish and Wildlife Service
Local	City of Tacoma
	City of Seattle
	City of Bellingham
	Chelan County P.U.D.
	Pacific Power/PacificCorp
	Puget Sound Energy
	Washington Water Power Company
	Snohomish County P.U.D.
	Colville Confederated Tribes
	Spokane County
	Yakama Indian Nation
	Whatcom County
	Pierce County
	Kalispel Tribe of Indians
	Spokane Indian Tribe
	Jamestown S'Klallam Tribe
	Sauk-Suiattle Tribe of Indians
	Stillaguamish Tribe
Private	Okanogan Irrigation District
	Wenatchee Heights Irrigation District
	Newman Lake Homeowners Association
	Whitestone Reclamation District
	Kinross Mining

***Other organizations and individuals furnish valuable information for the snow survey reports. Their cooperation is gratefully acknowledged.**

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Mount Vernon, WA 98273-2873

Washington Water Supply Outlook Report

Natural Resources Conservation Service
Spokane, WA